PHYSICS

Class - XII

Date 09– 05 - 2010 | **Duration : 1 Hours** | **Max. Marks : 80**

UNIQUE TEST - 1

INSTRUCTIONS

Do not break the seal of the question paper booklet before instructed to do so by the invigilator

Section A contains 15 question and Section-C contains 5 questions and total number of pages are 8. Please ensure that the Questions paper you have received contains ALL THE QUESTIONS in each section and PAGES.

SECTION - A

1. Question **1** to Quesion **8** has four choices (A), (B), (C), (D) out of which **only one is correct** & carry **4 marks** each. **1** mark will be deducted for each wrong answer.
2. Question **9** to Question **11** has four choices (A), (B), (C), (D) Out of which **one or more than one is/are correct** and carry **5 marks** each. 2 mark will be deducted for each wrong answer.
3. **Question 12** is Reasoning type question, contains Statement-1 (Assertion) & Statement-2 (Reason) Questions has 4 choices (A), (B), (C), (D) out of which **only one is correct** & carry **4 marks,** 1 mark will be deducted for wrong answer.
4. Question **13** to Question **15** are based upon a **paragraph**. Each Question has 4 choices (A), (B), (C), (D) out of which only **one is correct** & carry **3 marks** each. 1 mark will be deducted for each wrong answer.

SECTION - C

1. Questions **16** to Questions **20** are **subjective question** (whose answer are upto 4 digits) & carry **4 marks** each. No negative marking for this section.

NOTE : GENERAL INSTRUCTION FOR FILLING THE OMR ARE GIVEN BELOW.

1. Use only **HB pencil** or **blue/black pen (avoid gel pen)** for darkening the bubble.
2. Indicate the correct answer for each question by filling appropriate bubble in your OMR answer sheet.
3. The Answer sheet will be checked through computer hence, the answer of the question must be marked by shading the circles against the question by dark **HB pencil or blue/black pen**.
4. While filling the bubbles please be careful about SECTIONS [i.e. Section-A include single correct answers, multi correct answers, reasoning type, paragraph type), Section-B (include match the column), Section - C (include subjective answers)]

SECTION-A

For example if only 'A' choice is correct then, the correct method for filling the bubble is

A	B	C	D	E
●	○	○	○	○

For example if only 'A & C' choices are correct then, the correct method for filling the bubble is

A	B	C	D	E
●	○	●	○	○

the wrong method for filling the bubble are

⊘ ⊗ ◉ ◔ ◕

The answer of the questions in wrong or any other manner will be treated as wrong.

SECTION-B

For example If Correct match for (A) is P; for (B) is R, S; for (C) is Q; for (D) is P, Q, S then the correct method for filling the bubble is

	P	Q	R	S	T
A	●	○	○	○	○
B	○	○	●	●	○
C	○	●	○	○	○
D	●	●	○	●	○

SECTION-C

Ensure that all columns are filled. Answers, having blank column will be treated as incorrect. Insert leading zero(s) if required :

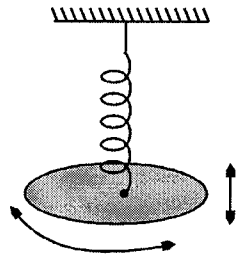
'6' should be filled as 0006	'86' should be filled as 0086	'1857' should be filled as 1857
●●●⓪	●●⓪⓪	⓪⓪⓪⓪
①①①①	①①①①	●①①①
②②②②	②②②②	②②②②
③③③③	③③③⑤	③③③③
④④④④	④④④④	④④④④
⑤⑤⑤⑤	⑤⑤⑤⑤	⑤⑤●⑤
⑥⑥⑥●	⑥⑥⑥●	⑥⑥⑥⑥
⑦⑦⑦⑦	⑦⑦⑦⑦	⑦⑦⑦●
⑧⑧⑧⑧	⑧⑧●⑧	⑧●⑧⑧
⑨⑨⑨⑨	⑨⑨⑨⑨	⑨⑨⑨⑨

SECTION - (A)

[STRAIGHT OBJECTIVE TYPE]

Q.1 to ***8*** has four choices (A), (B), (C), (D) out of which ***ONLY ONE*** is correct

1. A solid disk of radius R is suspended from a spring of linear spring constant k and torsional constant c, as shown in figure. In terms of k and c, what value of R will give the same period for the vertical and torsional oscillations of this system ?

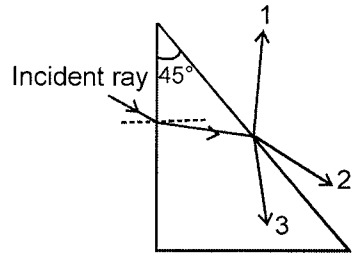


(A) $\sqrt{\frac{2c}{k}}$ (B) $\sqrt{\frac{c}{2k}}$ (C) $2\sqrt{\frac{c}{k}}$ (D) $\frac{1}{2}\sqrt{\frac{c}{k}}$

2. A particle executes SHM with amplitude of oscillations A and time period T. Find the magnitude of average acceleration for the period of time in which it moves from mean position by a distance $\frac{A}{2}$

(A) $\frac{3\pi A}{T^2}$ (B) $\frac{12\pi A}{T^2}$ (C) $\frac{12\pi A(2-\sqrt{3})}{T^2}$ (D) None of these

3. A light ray strikes a prism as shown in the drawing. The angle of the prism are 90°, 45° and 45°. The critical angle of the prism material is 49°. What rays are the possible continuations of the incident ray ?

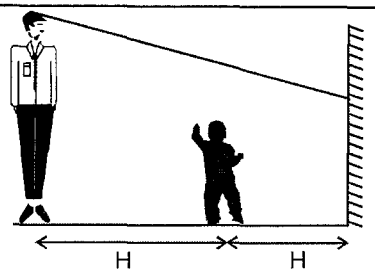


(A) The ray 1 only (B) The ray 2 only
(C) The ray 3 only (D) Both rays 2 and 3

4. A concave mirror is used to form image of the Sun on a white screen. If the lower half of the mirror were covered with an opaque card, the effect on the image on the screen would be
(A) negligible (B) to make the image less bright than before
(C) to make the upper half of the image disappear (D) to make the lower half of the image disappear

(SPACE FOR ROUGH WORK)

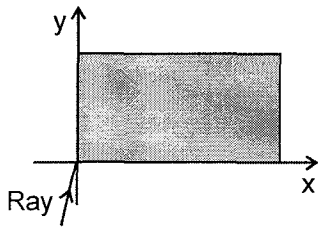
5. A child is standing in front of a vertical plane mirror. His father is standing behind him, as shown in the figure. The height of the father is 2H. The height of the eye level of the child is H. What is the minimum height of the mirror required so that the child can completely see his own and his father's image in the mirror ?



(A) $\frac{H}{2}$ (B) $\frac{5H}{6}$

(C) $\frac{3H}{2}$ (D) H

6. A ray of light travelling in air is incident almost along y-axis on a medium of variable refractive index at the origin. The refractive index of the medium changes according to the relation $\mu = 1 + x^2$. What is the light ray vector at the point where the x coordinate becomes equal to 1 ?



(A) $(\sqrt{3}/2)\hat{i} + (1/2)\hat{j}$ (B) $(1/2)\hat{i} + (\sqrt{3}/2)\hat{j}$ (C) $(1/\sqrt{2})\hat{i} + (1/\sqrt{2})\hat{j}$ (D) none

7. A mass m is hung on an ideal massless spring. Another equal mass is connected to the other end of the spring. The whole system is at rest. At t = 0, m is released and the system falls freely under gravity. Assume that natural length of the spring is L_0, its initial stretched length is L and the acceleration due to gravity g. What is distnace between masses as function of time.

(A) $L_0 + (L - L_0)\cos\sqrt{\frac{2k}{m}}t$ (B) $L_0\cos\sqrt{\frac{2k}{m}}t$ (C) $L_0\sin\sqrt{\frac{2k}{m}}t$ (D) $L_0 + (L - L_0)\sin\sqrt{\frac{2k}{m}}t$

8. The passenger side view mirror on an automobile often has the notation "Objects seen in the mirror are closer than they appear". Is the image really farther away than the object ?

(A) Yes, the image is smaller & farther away than the object

(B) No, the image is smaller & closer than the object.

(C) No, the image is larger & closer than the object.

(D) Yes, the image is larger & farther away than the object.

(SPACE FOR ROUGH WORK)

[MULTIPLE OBJECTIVE TYPE]

Q.9 to ***11*** has four choices (A), (B), (C), (D) out of which ***one or more than one*** is/are correct

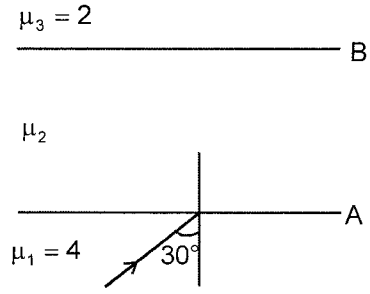
9. A light ray is incident on lower medium boundary at an angle 30° with the normal. Which of following statement is/are true ?

(A) If $\mu_2 > 2$ then total deviation is 60°

(B) If $\mu_2 < 2$ then total deviation is 60°

(C) If $\mu_2 > 2$ then total deviation is 120°

(D) If $\mu_2 < 2$ then total deviation is 120°



10. A simple harmonic oscillator consists of a mass sliding on a frictionless surface, attached to an ideal spring. Choose the correct statement.

(A) quadrupling the mass will double the period

(B) doubling the amplitude will change the frequency

(C) doubling the amplitude will double the total energy of the system

(D) doubling the amplitude will quadruple the total energy of the system.

11. There are three optical media 1, 2, and 3 with their refractive indices $\mu_1 > \mu_2 > \mu_3$. (TIR → total internal reflection)

(A) when a ray of light travels from 3 to 1 no TIR will take place

(B) critical angle between 1 and 2 is less than the critical angle between 1 and 3

(C) critical angle between 1 and 2 is more than the critical angle between 1 and 3

(D) chances of TIR are more when ray of light travels from 1 to 3 as compare to the case when it travel from 1 to 2

(SPACE FOR ROUGH WORK)

[REASONING TYPE]

Q.12 is Reasoning type question, contains Statement-1 (Assertion) and Statement-2 (Reason) Each questions has four choices (A), (B), (C), (D) out of which ***only one*** is correct

12. **Statement-1 :** Paraxial rays are always parallel to the axis of mirror or lens.
Statement-2 : A parallel beam close to principal axis converges at the focal point.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false
(D) Statement-1 is false, statement-2 is true

[COMPREHENSION TYPE]

Q.13 to **15** are based upon a paragraph. Each questions has four choices (A), (B), (C), (D) out of which ***only one*** is correct.

A thief is running away in a car with velocity of 20 m/s. A police jeep is following him, which is sighted by thief in his rear view mirror, which is a convex mirror of focal length 10 m. He observes that the image of jeep is moving towards him with a velcoity of 1 cm/s. If the magnification of mirror for the jeep at that time is $\frac{1}{10}$. Find :

Assume the police jeep is on axis of the mirror.

13. The distance of the jeep from the mirror is :
(A) 90 m (B) 80 m (D) 60 (D) none of these

14. the actual speed of jeep
(A) 21 m/s (B) 20 m/s (C) 19 m/s (D) none of these

15. Rate at which magnification is changing.
(A) 10^{-3} (B) 10^{-4} (C) 1 (D) none of these

(SPACE FOR ROUGH WORK)

SECTION - (C)

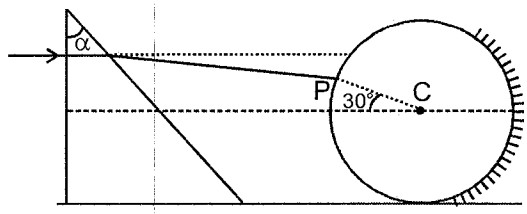
[SUBJECTIVE]

Q.16 to *20* are subjective type questions

1. A simple pendulum is suspended from the ceiling of an empty box falling in air near earth surface. The total mass of system is M. The box experiences air resistance $\vec{R} = -k\vec{v}$ where v is the velocity of box and k is a positive constant. After some time it is found that period of oscillation of pendulum becomes double the value when it would have suspended from a point on earth. The velocity of box at that moment (take g = 10 m/s^2, k = 5/2 N s m^{-1}, M = 5 kg in air same as on earth's surface)

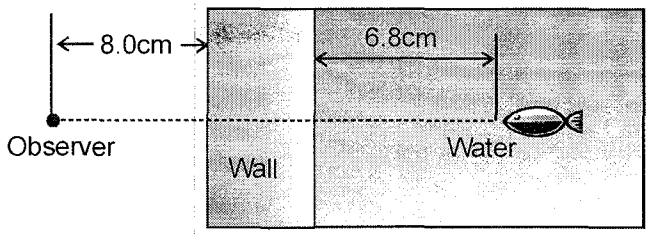
2. A light ray parallel to the x-axis strikes the outer reflecting surface of a sphere at a point (2, 2, 0). Its center is at the point (0, 0, –1). The unit vector along the direction of the reflected ray is $x\hat{i} + y\hat{j} + z\hat{k}$ Find the value of $\frac{yz}{x^2}$.

3. A ray is incident normally on a right angle prism whose refractive index is $\sqrt{3}$ and prism angle α = 30°, after crossing prism ray passes through glass sphere. It strikes the glass sphere at point P such that the line PC makes an angle of 30° with the optic axis, as shown in the figure sphere is half polished. Find the net angle of deviation of incident ray.



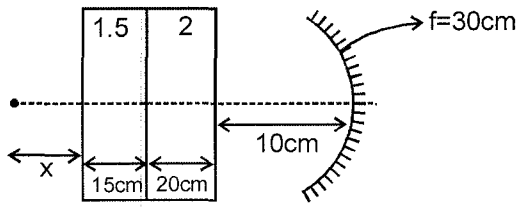
(SPACE FOR ROUGH WORK)

4. In figure, a fish watcher watches a fish through a 3.0 cm thick glass wall of a fish tank. The watcher is in level with the fish; the index of refraction of the glass is 8/5 and that of the water is 4/3.



To the fish, how far away does the watcher appear to be ?

5. Find out the value of x such that image will form on the object itself.



(SPACE FOR ROUGH WORK)

ROUGH WORK